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Effect of Growth Regulators and Growing Media on Seed Germination of Ber *(Ziziphus mauritiana*)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present investigation was carried out at Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, during the period 2023. The experiment was laid in completely randomized block design with 11 treatments and was replicated three times. Berc.v. Gola Ber were collected from Department of Horticulture, Sam Higginbottom University of Agriculture Technology and Science, Praygaraj. Seeds were Germinate in polybags. Seeds were soaked for 12 hours in both Ga3. The treatment T10 Soil + FYM + VC + PM (1:1:1:1) + GA3 @150ppm (Seed soaked for 12 hours) registered significantly maximum vegetative growth, Germination Percenatge % Stem diameter (mm). On the basis of our experimental finding it can be concluded that the best result was found in treatment T11 Soil + FYM +VC + PM (1:1:1:1) + IBA @50 ppm (Seed soaked for 12 hours) in term of vegetative growth parameters viz., plant height (cm), Number of leaves per plant Survival Percenatge %, leaf area (cm2) and, chlorophyll content of Ber (Ziziphus mauritiana) c.v. Gola ber.

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Keywords: FYM; Vermicompost; Soaked; GA3; IBA and Ber.

1. INTRODUCTION

The Indian Ber (Zizyphus mauritiana Lamk.) belong to family Rhamnaceae andgenus Ziziphus which includes about fifty species, and among those, 18 -20 species arenative to India (Pareek et al., 1983). It is tetraploid in nature with a chromosome number 2n=4x=48. Origin place of fruit ber is believed to be India to South - Western Asia. Ber is avery famous ancient fruit crop of India and China. It is also called as Chinese date or Chinese fig orplum [1-3].

It is considered as religious fruit of India, grown at various religious places of Hindus, Muslims and Sikhs. Ber is considered to be favorite fruit of Hindu Lord Shankar, whose devotion is believed to be unacceptable without offering him ber fruits especiallyduring festival of Maha Shivratri.

The use of this fruit is found in several Puranas, Vedasand other ancient literatures of India. In India, ber is cultivated in various part of countryparticularly in arid and semi-arid regions comprising of 53,000 ha area, producing 5.70 lakh MT of fruits (National Horticulture Board, 2021-22).

The major ber growing regions are Punjab, Haryana, Uttar Pradesh, Rajasthan Gujarat, Maharashtra, Andhra Pradesh, Bihar, Madhya Pradesh, Tamil nadu and Assam where as in Uttar Pradesh beror chards are found around Varanasi, Ayodhya, Agra and Raibareilly districts but it is an ideal fruit for cultivation in the dryland semi-arid zones of Northern India (Bal et al.,1982).

2. MATERIALS AND METHODS

Experimental Setup: - The experiment was conducted at the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, located in Prayagraj (UP), from 2022 to 2023.

Prayag raj, located at an elevation of 78 meters above sea level (25.87° N latitude and 81.150° E longitude), experiences a subtropical climate with notable temperature fluctuations. Winters can be chilly, with temperatures dropping to 20°C in December and January, while summers are scorching, with temperatures soaring to 50°C in May and June. Frost occurs in winter, and hot, dry winds are common in summer. The region receives an average rainfall of approximately 1013.4 cm, with the heaviest rainfall typically occurring from July to September, supplemented by occasional winter.

2.1 Running Status

2.1.1 Germination percent (%)

Germination percent was calculated as the number of seeds sown and the number of seeds.

3. RESULTS AND DISCUSSION

The result of the in investigation based on the various observations viz., sapling length (cm), Number of leaves per plant, stem diameter (cm), leaf area (cm^2) and, chlorophyll content and survivality % are presented and discussed in this chapter under appropriate headings and sub headings. The data given in the table are the mean values and have been statistically analysed.

This Data of leaf area (cm^2) influenced by seed treatment are presented in Table 1. Germination percent (%) recorded at 90 DAT showed significant variation among the treatment.

Statistical analysis at 90 DAT revealed a highest Germination percent (%) of (96%) was found in treatment T3 Soil + VC (1:1) + IBA @ 50ppm, which was on par with T10 Soil + FYM+ VC + PM (1:1:1:1) + GA3 @150ppm and differed significantly from other treatments. It was followed by T9 Soil + FYM (1:1) + seed soaking with IBA @50ppm 92, T8 Soil +FYM (1:1) + seed soaking with GA3 @ 150ppm 91. Where as the minimum leaf area (58) was found in treatment T_0 Control. The increase in girth might be due to optimum supply of plants nutrients and growth hormones in right amount during the entire crop period caused vigorously inducing the vegetative development of the plants and ultimately more photosynthesis.

Increase in germination percentage is might be due to GA_3 which acts on the embryo and causes synthesis of hydrolysing enzymes particularly amylase and protease and this hydrolysed food is utilized for growth of embryo and thereby enhanced the germination [4]. Similar results were also obtained by Deb et al. [5] in papaya. It might be due to the media

containing organic manures possess organic acid within them. Therefore, more available moisture and some acids may have helped in better germination percentage (Bisla et al. [6] These results were in close agreement with Mandal et al. [7] and Ramteke et al. [8] in papaya when they used cocopeat as ingredients of growing media.

3.1 Effect of Seed Treatment on Survival Per Cent (%) of Ber

The data obtained on survival percent (%) in ber after application seed treatment illustrated in Table 2. Statistical analysis of the results indicated that the survival (%) in ber differed significantly. The treatment T11 Soil + FYM + VC + PM (1:1:1:1) + IBA @ 50 ppm registered significantly maximum survival percent (92.00). It was followed by T10 Soil + FYM + VC + PM (1:1:1:1) + GA3@150ppm 85.00 and T2 Soil + vermin compost (1:1) + seed soaking with GA3 @ 150 ppm. Where as, the minimum survival percent (61.33) was found in treatment T7 Soil + FYM (1:1).

It might be due to soil and cocopeat is improved soil texture, structure, porosity, water holding capacity, activity of useful soil micro fauna and flora, maintained soil temperature and improved soil health and nutrient status of medium [9]. Similar results were also obtained by Bhardwaj [10] and Ramteke et al. [8] in papaya.

Table 1 Effect of seed treatment on germination (%) of ber

Treatments	Germination per cent (%)
T_0-CONTROL	58
T_1- Soil + vermicompost (1:1)	91
T_2- Soil + vermicompost (1:1) + seed soaking with GA3@150ppm	91
T_3- Soil + vermicompost (1:1) + seed soaking with IBA@50ppm	96
T_4- Soil + Poultry manure (1:1)	92
T_5- Soil + Poultry manure (1:1) + seed soaking with GA3@ 150ppm	92
T_6- Soil + Poultry manure (1:1) + seed soaking with IBA@50ppm	90
T_7- Soil + FYM (1:1)	87
T_8- Soil + FYM (1:1) + seed soaking with GA3 @150ppm	91
T_9- Soil + FYM (1:1) + seed soaking with IBA@50ppm	92
T_{10} -Soil +FYM+VC+PM (1:1:1:1) + GA3 @150 ppm	92
T_{11} -Soil + FYM+VC +PM (1:1:1:1) + IBA @50 ppm	90
F-Test	S
SE.d (±)	1.962
C.V.	2.716
C.D. at 5%	4.096

Table 2. Effect of Seed Treatment on Survival per cent (%) of ber

Treatments	Survival percentage
T_0-CONTROL	52.66
T_1- Soil + vermicompost (1:1)	66.52
T_2- Soil + vermicompost (1:1) + seed soaking with GA3@150ppm	76.67
T_3- Soil + vermicompost (1:1) + seed soaking with IBA@50ppm	72.78
T_4- Soil + Poultry manure (1:1)	65.67
T_5- Soil + Poultry manure (1:1) + seed soaking with GA3@ 150ppm	74.33
T_6- Soil + Poultry manure (1:1) + seed soaking with IBA@50ppm	65.67
T_7- Soil + FYM (1:1)	61.33
T_8- Soil + FYM (1:1) + seed soaking with GA3 @150ppm	66.33
T_9- Soil + FYM (1:1) + seed soaking with IBA@50ppm	64.58
T_{10} -Soil +FYM+VC+PM (1:1:1:1) + GA3 @150 ppm	85.00
T_{11} -Soil + FYM+VC +PM (1:1:1:1) + IBA @50 ppm	92.00
F-Test	S
SE.d (±)	1.503
C.V.	2.620
C.D. at 5%	3.138

3.2 Effect of Seed Treatment on Number of Leaves of Ber

Data of number of number of leaves influenced by application of GA3 and IBA are presented in Table 3 Observation on number of leaves recorded at 90 DAT showed significant variation among the treatment.

Statistical analysis at 90 DAT revealed a highest number of leaves of (9.85) was found in treatmentT11 Soil + FYM + VC + PM (1:1:1:1) + IBA @ 50ppm, which was on par with T10Soil+FYM+VC+PM (1:1:1:1) + GA3 @150ppm and differed significantly from other treatments. It was followed by T5 Soil + Poultry manure (1:1) + seed soaking with GA3@ 150ppm, T9 Soil + FYM (1:1) + seed soaking with IBA @50ppm 8.85. Where as the minimum leaf area (6.48) was found in treatment T_0 Control. The increase in girth might be due to optimum supply of plants nutrients and growth hormones in right amount during the entire crop period caused vigorously inducing the vegetative development of the plants and ultimately more photosynthesis.

It might be due to the cocopeat provides adequate nutrients and enhances both the physical and biological properties and the water holding capacity of soil [11]. These results were also in conformity with the finding of Kumawat et al. [12] in papaya when they used cocopeat as ingredients of growing media [13-15].

Table 3. Effect of Seed treatment on Number of leaves of Ber

Treatments	No. of leaves
T_0-CONTROL	6.48
T_1- Soil + vermicompost (1:1)	7.83
T_2- Soil + vermicompost (1:1) + seed soaking with GA3@150ppm	8.58
T_3- Soil + vermicompost (1:1) + seed soaking with IBA@50ppm	8.22
T_4- Soil + Poultry manure (1:1)	8.64
T_5- Soil + Poultry manure (1:1) + seed soaking with GA3@ 150ppm	8.85
T_6- Soil + Poultry manure (1:1) + seed soaking with IBA@50ppm	8.52
T_7- Soil + FYM (1:1)	7.96
T_8- Soil + FYM (1:1) + seed soaking with GA3 @150ppm	8.28
T_9- Soil + FYM (1:1) + seed soaking with IBA@50ppm	7.53
T_{10} -Soil +FYM+VC+PM (1:1:1:1) + GA3 @150 ppm	9.47
T_{11} -Soil + FYM+VC +PM (1:1:1:1) + IBA @50 ppm	9.85
F-Test	S
SE.d (±)	0.190
C.V.	2.780
C.D. at 5%	0.396

Table 4 Effect of Seed treatment on leaf area (cm^2) of Ber

Treatments	Leaf area
T_0-CONTROL	2.89
T_1- Soil + vermicompost (1:1)	3.36
T_2- Soil + vermicompost (1:1) + seed soaking with GA3@150ppm	3.72
T_3- Soil + vermicompost (1:1) + seed soaking with IBA@50ppm	3.49
T_4- Soil + Poultry manure (1:1)	3.35
T_5- Soil + Poultry manure (1:1) + seed soaking with GA3@ 150ppm	3.80
T_6- Soil + Poultry manure (1:1) + seed soaking with IBA@50ppm	3.62
T_7- Soil + FYM (1:1)	3.69
T_8- Soil + FYM (1:1) + seed soaking with GA3 @150ppm	3.82
T_9- Soil + FYM (1:1) + seed soaking with IBA@50ppm	3.85
T_{10} -Soil +FYM+VC+PM (1:1:1:1) + GA3 @150 ppm	4.00
T_{11} -Soil + FYM+VC +PM (1:1:1:1) + IBA @50 ppm	4.04
F-Test	S
SE.d (±)	0.066
C.V.	2.236
C.D. at 5%	0.139

Data of leaf area (cm^2) influenced by application of GA3 and IBA are presented in Table 4. Observation on leaf area (cm^2) recorded at 90 DAT showed significant variation among the treatment. Statistical analysis at 90 DAT revealed a highest leaf area (cm^2) of (4.04) was found in treatmentT11 Soil + FYM + VC + PM (1:1:1:1) + IBA @50ppm, which was on par with T10 Soil+ FYM + VC + PM (1:1:1:1) + GA3 @150ppm and differed significantly from other treatments. It was followed by T9 Soil + FYM (1:1) + seed soaking with IBA@50ppm 3.85, T8 Soil + FYM (1:1) + seed soaking with GA3@150ppm 3.82. Where as the minimum leaf area (cm^2) (2.89) was found in treatment T_0Control. The increase in girth might be due to optimum supply of plants nutrients and growth hormones in right amount during the entire crop period caused vigorously inducing the vegetative development of the plants and ultimately more photosynthesis [16-19].

This might be due to combination of this media provided better condition like aeration and porosity for proper growth and development of seedlings leads to increase number of leaves. These results were in close agreement with Ramteke et al. [8] in papaya when they used cocopeat as ingredients of growing media [20-22].

4. CONCLUSION

On the basis of our experimental finding it can be concluded that the best result was found in treatment T11 Soil +FYM+VC+PM (1:1:1:1) + IBA @50 ppm in term of vegetative growth parameters viz., sapling length (cm), Number of leaves per plant , leaf area (cm^2), shoot length , root length and root to shoot ratio followed by T10 in termes of stem diameter (cm) and chlorophyll content (mg) of ber (*Ziziphus mauritana* L.) cv. Gola ber.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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